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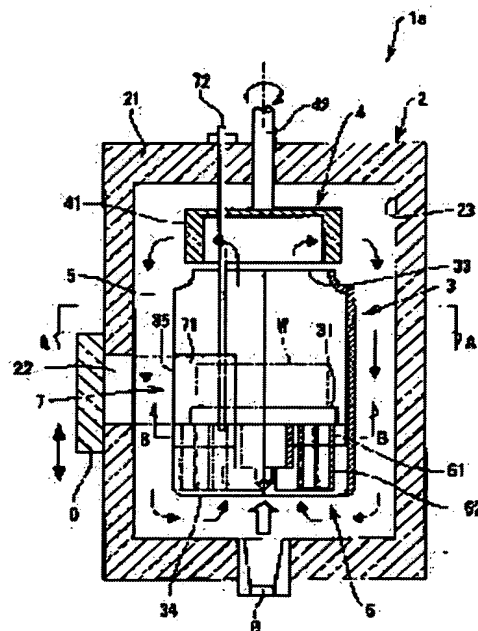
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(54) HIGH SPEED HEATING-UP FURNACE

(57)Abstract:

PROBLEM TO BE SOLVED: To structurally improve heating-up efficiency to a work by eliminating any disturbing structure in hot blast circulating path in a furnace chamber.

SOLUTION: In a high speed heating-up furnace for heating up the work W at high speed by coaxially disposing a cylindrical work holding chamber 3 in the furnace chamber 2 and forcibly convecting the hot blast generated with a burner B as eddy current with a circulating fan 4, a door 7 is arranged at a second work carrying port 35 in the work holding chamber 3. Then, the circulating path for uniformly circulating the hot blast over the whole circumference between the furnace chamber 2 and the work holding chamber 3, is secured by closing the door 7.



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CLAIMS

[Claim(s)]

[Claim 1] The furnace room in which it is surrounded by the bridge wall which has work-piece conveyance opening, and heating means, such as a burner, were formed towards the inside, The tubed work-piece receipt room in which the installation shelf which is arranged in the said alignment with a predetermined clearance in the above-mentioned furnace interior of a room from the internal surface, and lays a work piece in the interior was formed, In the high-speed temperature up furnace equipped with the circulation fan who circulates through the ambient atmosphere of the above-mentioned furnace interior of a room heated by the above-mentioned heating means compulsorily via the above-mentioned work-piece receipt room the above-mentioned work-piece receipt room When it has the 2nd work-piece conveyance opening which countered the above-mentioned work-piece conveyance opening of the above-mentioned furnace room, and has been arranged, the door which can be opened and closed is prepared in work-piece conveyance opening of the above 2nd and the above-mentioned door is a closed state, The high-speed temperature up furnace characterized by securing the circulation path through which the above-mentioned ambient atmosphere circulates over the perimeter between the wall of the above-mentioned furnace room, and the outer wall of the above-mentioned work-piece receipt room.

[Claim 2] It turns in the above-mentioned work-piece conveyance opening direction of the above-mentioned furnace room, and the above-mentioned door is the high-speed temperature up furnace according to claim 1 which can be opened and closed to double doors opening outward.

[Claim 3] The high-speed temperature up furnace according to claim 1 or 2 at which the straightening vane for maintaining the above-mentioned vortex is formed in the above-mentioned receipt room's intake side in case the above-mentioned ambient atmosphere generated in the shape of a vortex is led to the above-mentioned receipt room by the above-mentioned circulation fan through the above-mentioned circulation path.

[Claim 4] The above-mentioned straightening vane is a high-speed temperature up furnace according to claim 3 formed in the shape of radii for converging [of the above-mentioned receipt room] in the hand of cut and this direction of the above-mentioned circulation fan towards shaft orientations from a periphery.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a high-speed temperature up furnace with temperature up effectiveness sufficient structural more, if a work piece is said in more detail by circulating through hot blast about the high-speed temperature up furnace for carrying out a temperature up to a high speed to predetermined heat treatment temperature.

[0002]

[Description of the Prior Art] An aluminium alloy can adjust the property of reinforcement, moldability, and others, and is used abundantly by cold working, solution treatment, high temperature aging, annealing, etc. as an iron alternate material from a low consistency, high rigidity, *****, etc. also in physical properties at the aircraft, a vehicle, etc.

[0003] Also in it, the 2000 system (aluminum-Cu) alloy and the 5000 (aluminum-Mg) system alloy are known as a typical aluminium alloy with which solid-solution strengthening which is the typical physical property of an aluminium alloy, and an age-hardening appear notably. The reinforcement and rigidity in which these alloys rival iron after shaping T-four processing (solution treatment -> natural aging) and by carrying out T6 processing (solution treatment -> artificial aging) are acquired.

[0004] After solution treatment holds a work piece in the dissolution temperature region in a metal state diagram and melts a deposit phase into a host phase, it means the processing for obtaining a supersaturated solid solution by performing quenching. According to this, since hole concentration is frozen in the state of supersaturation, according to a pinning operation of a deposit phase [as opposed to a host phase by subsequent aging treatment], dispersion strengthening works firmly and the reinforcement of an ingredient improves by leaps and bounds.

[0005] By the way, high processing distortion, such as a rearrangement, is being accumulated in work pieces, such as a forging and a cold-working article. When carrying out solution treatment of the work piece in this condition, there is knowledge of being so good that the heating up time of a work piece being short. That is, since the thermal-expansion stress (diffusion coefficient) which originates in the mass difference of a work-piece simple substance by processing distortion is partially uneven, the recovery rate of a crystal becomes uneven, and after processing produces variation in quality according to elastic-plastic deformation. Then, it is for suppressing the variation to the minimum by carrying out the temperature up of the work piece quickly.

[0006] So, at some solution treatment processes, solution treatment is performed combining the high-speed temperature up furnace and holding furnace for carrying out the temperature up of the work piece to a high speed and homogeneity. An example of the high-speed temperature up furnace of them is shown in drawing 4 . This high-speed temperature up furnace 1 is surrounded by the bridge wall 21 which has the work-piece carrying-in opening 22 on a side face, and consists of a furnace room 2 where the heating means B, such as a burner, were formed in the lower part, a work-piece receipt room 3 of the shape of a cylinder arranged in the said alignment in the furnace room 2, and a circulation fan (radial fan) 4 prepared at the up opening 33 side of the work-piece receipt room 3.

[0007] The installation shelf 31 which lays a work piece W is formed in the work-piece receipt room 3 interior, and the work-piece conveyance way 32 which was open for free passage to the work-piece conveyance opening 22 of the furnace room 2 in parallel with this installation shelf 31 is formed in one. The door D for blockading the work-piece conveyance opening 22 is formed in the skin of the work-piece conveyance opening 22 possible [closing motion].

[0008] The hot blast in the work-piece receipt room 3 directly heated by the heating means B by operating

- the circulation fan 4 is sucked up from the up opening 33, and after it serves as a vortex and descends the circulation path 5 between the furnace room 2 and the work-piece receipt room 3, it is again led to the work-piece receipt room 3 from the lower opening 34 of the work-piece receipt room 3 with the burner flame of the heating means B.

[0009] According to this, the ambient atmosphere in the furnace room 2 including the work-piece receipt room 3 was heated quickly, and it became possible to carry out the temperature up of the work piece W in the work-piece receipt room 3 to quickness and homogeneity to desired heat treatment temperature.

[0010]

[Problem(s) to be Solved by the Invention] however, when it is going to gather the temperature up effectiveness of a work piece W further, with the conventional configuration mentioned above Since the work-piece conveyance way 32 is in the circulation path 5 of the hot blast sent out from the circulation fan 4, This work-piece conveyance way 32 could not be resisting, and the vortex generated by the circulation fan 4 could not descend to homogeneity, but there was a possibility that the flow rate to the lower opening 32 of the work-piece receipt room 3, homogeneity, etc. might become an ununiformity.

[0011] Moreover, when turning again the vortex which turned caudad and was generated in the work-piece receipt room 3 and drawing it upwards, a part of hot blast stagnated near [lower opening 34] the work-piece receipt room 3, the turbulent flow was produced, and there were this turbulent flow and a possibility of becoming the inflow resistance to the work-piece receipt room 3.

[0012] Then, it is made in order that this invention may solve the technical problem mentioned above, and the purpose loses what bars the hot blast circuit of the furnace interior of a room, and is to offer the high-speed temperature up furnace which can raise the temperature up effectiveness of a work piece more structurally.

[0013]

[Means for Solving the Problem] The furnace room in which this invention is surrounded by the bridge wall which has work-piece conveyance opening, and heating means, such as a burner, were formed towards the inside in order to attain the purpose mentioned above, The tubed work-piece receipt room in which the installation shelf which is arranged in the said alignment with a predetermined clearance in the above-mentioned furnace interior of a room from the internal surface, and lays a work piece in the interior was formed, In the high-speed temperature up furnace equipped with the circulation fan who circulates through the ambient atmosphere of the above-mentioned furnace interior of a room heated by the above-mentioned heating means compulsorily via the above-mentioned work-piece receipt room the above-mentioned work-piece receipt room When it has the 2nd work-piece conveyance opening which countered the above-mentioned work-piece conveyance opening of the above-mentioned furnace room, and has been arranged, the door which can be opened and closed is prepared in work-piece conveyance opening of the above 2nd and the above-mentioned door is a closed state, It is characterized by securing the circulation path through which the above-mentioned ambient atmosphere circulates over the perimeter between the wall of the above-mentioned furnace room, and the outer wall of the above-mentioned work-piece receipt room.

[0014] According to this, a door is closed at the time of heating of a work piece, and since what becomes air resistance is lost in the circulation path prepared between the furnace room and the work-piece receipt room, the hot blast circulation more near an ideal condition is obtained.

[0015] In this invention, although it is desirable on a design for it to be able to open and close to double doors opening outward towards the above-mentioned work-piece conveyance opening direction of the above-mentioned furnace room as for the above-mentioned door, you may be the slide type door slid along a work-piece receipt room in addition to this, and when a door is a closed state, especially if blockaded along a work-piece receipt room, it will not be limited.

[0016] In order to lead more efficiently the hot blast which circulated through the furnace interior of a room to the work-piece receipt interior of a room, it is desirable that the straightening vane for maintaining the above-mentioned vortex is formed in the above-mentioned receipt room's intake side in case the above-mentioned ambient atmosphere generated in the shape of a vortex is led to the above-mentioned receipt room by the above-mentioned circulation fan through the above-mentioned circulation path.

[0017] the above-mentioned straightening vane is formed in the shape of radii for converging [of the above-mentioned receipt room] in the hand of cut and this direction of the above-mentioned circulation fan towards shaft orientations from a periphery -- ** -- it is desirable, and according to this, a vortex is accelerated more, it is led to the work-piece receipt interior of a room, and the temperature up effectiveness of a work piece increases as a result.

[0018]

[Embodiment of the Invention] Next, the operation gestalt of this invention is explained. The flank sectional view which expressed typically the high-speed temperature up furnace concerning this operation gestalt to drawing 1 is shown. In addition, the same reference mark is used for the component consider that is the same as that of the conventional equipment of drawing 4 explained previously, or the same.

[0019] The furnace room 2 in which this high-speed temperature up furnace 1a was surrounded by the bridge wall 21 which has the work-piece conveyance opening 22 (it considers as the 1st work-piece conveyance opening hereafter) on a side face, and the heating means B, such as a burner, were formed towards that inside. It has the tubed work-piece receipt room 3 arranged in the said alignment in the furnace room 2, and the circulation fan (radial fan) 4 stationed at the up opening 33 side of the work-piece receipt room 3.

[0020] ***** D which opens and closes the 1st work-piece conveyance opening 22 is formed in the front face of the 1st work-piece conveyance opening 22 of the furnace room 2. In this operation gestalt, it connects with the rise-and-fall means which is not illustrated, and ***** D carries out slide closing motion in the vertical direction at the time of conveyance of a work piece W. In addition, it is not limited especially about the breaker style of ***** D.

[0021] In this operation gestalt, the heating means B consists of a high calorie burner using town gas etc., and it is arranged in same axle at the furnace room 2 bottom so that burner flame may be blown off towards the lower opening 34 of the work-piece stowage 3.

[0022] The work-piece receipt room 3 consists of a cylinder object (you may be an rectangular pipe object.) of heat-resistant metal with which opening of the both ends was carried out, and it is mostly arranged in the furnace room 2 in the said alignment in the center with the bracket which is not illustrated with predetermined spacing from the inner skin 23 of the furnace room 2. The installation shelf 31 with which a work piece W is laid is formed in the interior of the work-piece receipt room 3. In this operation gestalt, the installation shelf 31 is formed in the shape of [of a reed screen parallel to the conveyance direction of a work piece W] a child (refer to drawing 2).

[0023] In the side face of the work-piece receipt room 3 which countered the 1st work-piece conveyance opening 22 of the furnace room 2, the 2nd work-piece conveyance opening 35 for conveying a work piece W is formed in the work-piece receipt room 3. In this operation gestalt, opening of the 2nd work-piece conveyance opening 35 is carried out so that it may become the almost same aperture width as the 1st work-piece conveyance opening 22, and opening height.

[0024] As shown in drawing 2 (A-A line sectional view of drawing 1), the work-piece receipt room door 7 for opening and closing the opening is formed in the 2nd work-piece conveyance opening 35. The work-piece receipt room door 7 consists of doors 71a and 71b of two sheets formed in the shape of [which met the peripheral wall of the receipt room 3] radii, and each doors 71a and 71b are attached in double doors opening outward possible [closing motion] towards the 1st work-piece conveyance opening 22 in this operation gestalt.

[0025] Each doors 71a and 71b and the receipt room 3 are connected by hinge regions 73 and 73, and each doors 71a and 71b are connected with door opening close means, such as a motor formed in the exterior of the furnace room 2 through the closing motion shaft 72. As for a hinge region 73, in this operation gestalt, it is desirable to be formed in the configuration which made resistance of hot blast small as much as possible. Moreover, as for the wall 23 of the furnace room 2, it is desirable to be formed in the shape of a cylinder along with the peripheral face of the work-piece receipt room 3.

[0026] According to this, when each doors 71a and 71b are closed states, between the furnace room 2 and the work-piece receipt room 3, the circulation path 5 at the time of the hot blast generated by the circulation fan 4 over the perimeter circulating through the inside of the furnace room 2 is secured. That is, since there is nothing that interrupts the circulation path 5, it can be stabilized to the lower part of the receipt room 3, and hot blast can be passed.

[0027] The straightening vane 6 for accelerating further the vortex which circulates through the inside of the work-piece receipt room 3 is formed in the lower opening 34 side of the work-piece receipt room 3. The straightening vane 6 consists of blades 61 of a large number converged [of the receipt room 3] in the shape of radii towards shaft orientations from a periphery as shown in drawing 3 .

[0028] In this operation gestalt, it converges in the hand of cut and this direction of the circulation fan 4, and according to this, it becomes easy to generate the vortex of the same hand of cut as the circulation fan's 4 hand of cut in the receipt room 3 interior, and can be circulated through a blade 61 that hot blast does not have resistance [inside / of the receipt room 3]. Moreover, the rib 62 for reinforcement protrudes on the straightening-vane 6 bottom towards the direction of burner B.

[0029] Again, reference of drawing 1 constitutes the circulation fan 4 from a rotation shaft 42 which

transmits turning effort to the fan body 41 and the fan body 41 of the cross-section U shape where the lower part side was opened wide. In this operation gestalt, by rotating the rotation shaft 42 which consisted of a radial fan with which many wings which are not illustrated to a periphery were prepared, and was connected to the driving means which is not illustrated, the fan body 41 sucks up the hot blast in the work-piece receipt room 3, and blows off in the circulation path 5 between the furnace room 2 and the work-piece receipt room 3.

[0030] A series of actuation of the high-speed temperature up furnace 1 constituted as mentioned above is explained. Where the hot blast of predetermined temperature is circulated in the furnace room 2 by the circulation fan 4, after laying the work piece W held by the conveyance means which opens ***** D and the work-piece receipt room door 7, and is not illustrated in the installation shelf 31 in the work-piece receipt room 3 through the 2nd conveyance opening 35 from the 1st conveyance opening 22, the work-piece receipt room door 7 and ***** D are shut. The closing motion sequence may carry out ***** D side first, and may carry out first the work-piece receipt room door 7 side.

[0031] Anyway, since the circulation path 5 of homogeneity is mostly secured over the perimeter by closing the work-piece receipt door 7 between the furnace room 2 and the work-piece receipt room 3, hot blast serves as a vortex, circulates through the inside of a furnace, and can carry out the temperature up of the work piece W to desired processing temperature in a high speed and the condition of having been stabilized. After the temperature up of a work piece W, a work piece W is again taken out from the inside of a furnace through the work-piece conveyance openings 22 and 25, and is transported to the holding furnace which is not illustrated.

[0032] In the above-mentioned operation gestalt, although constituted by the double-doors-opening-outward door, if the work-piece receipt room door 7 is a configuration which may be the slide type door which can be opened and closed and does not bar the circulation path 5 along the work-piece receipt room 3 at the time of lock out other than this, it is selectable suitably.

[0033] Moreover, although one work piece W is laid in the installation shelf 31 with the above-mentioned operation gestalt, it forms in a major diameter more and you may make it lay two or more work pieces W. In this case, on the occasion of the ejection of a work piece W, the installation shelf 31 may be constituted on a turntable and such a mode is also contained in this invention.

[0034]

[Effect of the Invention] Since there is nothing that is resisting in the circulation path between a furnace room and a work-piece receipt room in the high-speed temperature up furnace which carries out a rapid temperature up by carrying out hot blast circulation of the work piece according to this invention as explained above, the temperature up effectiveness of a work piece can be raised more.

[0035] Moreover, temperature up effectiveness can be further raised by forming a straightening vane in the lower limit of a work-piece receipt room, and generating a strong vortex by the work-piece receipt interior of a room.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The flank sectional view of the high-speed temperature up furnace concerning one example of this invention.

[Drawing 2] The A-A line sectional view of drawing 1 .

[Drawing 3] The B-B line sectional view of drawing 1 .

[Drawing 4] The flank sectional view of the conventional high-speed temperature up furnace.

[Description of Notations]

1a High-speed temperature up furnace

2 Furnace Room

21 Bridge Wall

22 1st Work-Piece Conveyance Opening

3 Work-Piece Receipt Room

31 Installation Shelf

32 Work-Piece Conveyance Way

33 Up Opening

34 Lower Opening

35 2nd Work-Piece Conveyance Opening

4 Circulation Fan

41 Circulation Fan Body

42 Rotation Shaft

5 Circulation Path

6 Straightening Vane

61 Blade

7 Work-Piece Receipt Room Door

71a, 71b Door

72 Closing Motion Shaft

73 Hinge Region

D *****

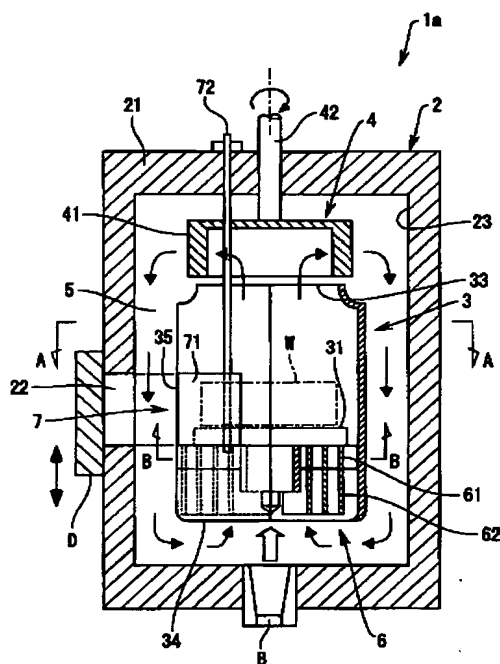
B Heating means

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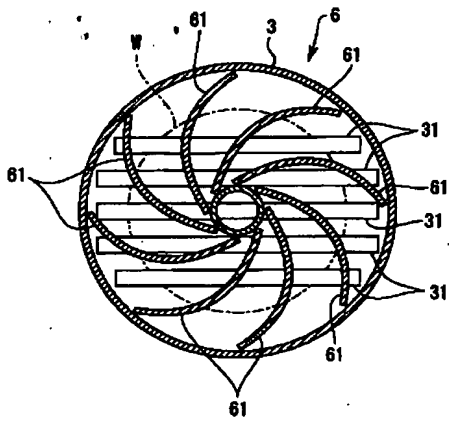
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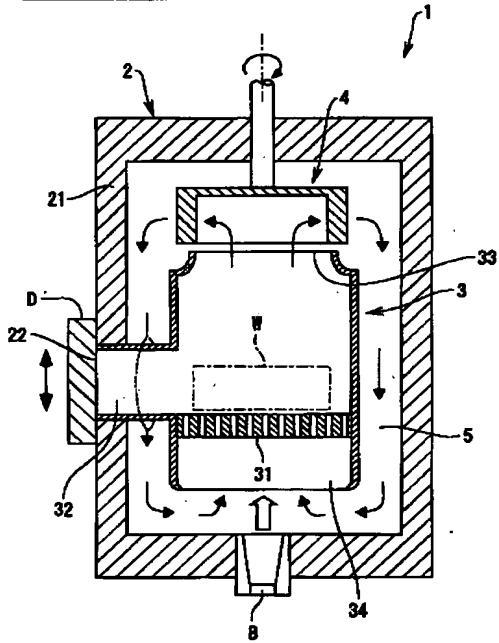
[Drawing 1]



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[Drawing 4]



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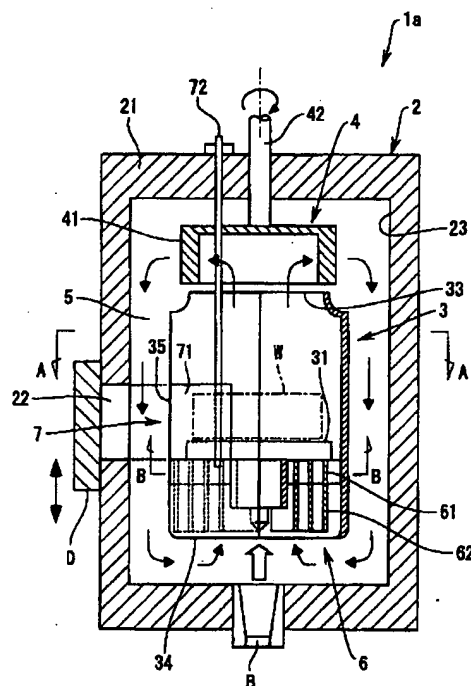
Fターム (参考) 4K063 AA05 CA01 CA06 DA26 DA28
DA32

(54) 【発明の名称】 高速昇温炉

(57) 【要約】

【課題】 炉室内の熱風循環路内を妨げるものをなくし、構造的にワークの昇温効率を高める。

【解決手段】 炉室2内に筒状のワーク収納室3を同軸的に配置し、バーナBにて生成された熱風を循環ファン4により渦流として強制的に対流させて、ワークWを高速で昇温するための高速昇温炉において、ワーク収納室3の第2ワーク搬送口35に扉7を設け、扉7を閉じることにより、炉室2とワーク収納室3との間の全周にわたって熱風が均一に循環される循環通路を確保する。



【特許請求の範囲】

【請求項 1】 ワーク搬送口を有する耐火壁によって囲まれており、その内側に向けてバーナなどの加熱手段が設けられた炉室と、上記炉室内にその内壁面から所定の隙間をもって同心的に配置され、内部にワークを載置する載置棚が設けられた筒状のワーク収納室と、上記加熱手段により加熱された上記炉室内の雰囲気を上記ワーク収納室を経由して強制的に循環する循環ファンとを備えた高速昇温炉において、

上記ワーク収納室は、上記炉室の上記ワーク搬送口に対向して配置された第 2 のワーク搬送口を有し、上記第 2 のワーク搬送口には開閉可能な扉が設けられ、上記扉が閉状態のとき、上記炉室の内壁と上記ワーク収納室の外壁との間の全周にわたって上記雰囲気が循環する循環通路が確保されることを特徴とする高速昇温炉。

【請求項 2】 上記扉は、上記炉室の上記ワーク搬送口方向に向けて観音開き式に開閉可能である請求項 1 に記載の高速昇温炉。

【請求項 3】 上記収納室の吸込側には上記循環ファンによって渦流状に生成された上記雰囲気が上記循環通路を通して上記収納室に導かれる際に、上記渦流を維持させるための整流板が設けられている請求項 1 または 2 に記載の高速昇温炉。

【請求項 4】 上記整流板は、上記循環ファンの回転方向と同方向に上記収納室の外周方向から軸方向に向けて収束するに円弧状に設けられている請求項 3 に記載の高速昇温炉。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、熱風を循環することにより、ワークを所定の熱処理温度まで高速に昇温させるための高速昇温炉に関し、さらに詳しく言えば、構造的により昇温効率のよい高速昇温炉に関する。

【0002】

【従来の技術】アルミニウム合金は、冷間加工、溶体化処理、時効硬化処理、焼きなましなどによって強度、成型性およびその他の性質を調節することができ、物性的にも低密度、高剛性、易加工性などから鉄の代替材として、航空機、車輛などに多用されている。

【0003】中でも、2000系 (Al-Cu) 合金や 5000 (Al-Mg) 系合金は、アルミニウム合金の代表的な物理特性である固溶体強化と時効硬化が顕著に現れる代表的なアルミニウム合金として知られている。これら合金は成形後に T4 処理 (溶体化処理→自然時効) や T6 処理 (溶体化処理→人工時効) することによって鉄に匹敵する強度や剛性が得られる。

【0004】溶体化処理とは、金属状態図における固溶温度域にワークを保持して、母相中に析出相を溶かし込んだ後に急冷を行うことにより、過飽和固溶体を得るための処理をいう。これによれば、空孔濃度が過飽和状態

で凍結されているため、その後の時効処理によって母相に対する析出相のピン止め作用により、分散強化が強固に働き、材料の強度が飛躍的に向上する。

【0005】ところで、鍛造品や冷間加工品などのワークには、転位など高い加工歪が蓄積している。この状態でワークを溶体化処理する場合、ワークの昇温時間が短いほどよいという知見がある。すなわち、加工後は加工歪によってワーク単体の質量差に起因する熱膨張応力

(拡散係数) が部分的に不均一であるために結晶の回復速度が不均一となり、弾塑性変形によって品質にバラツキを生じる。そこで、ワークを急速に昇温することにより、そのバラツキを最小限に抑えるためである。

【0006】そこで、一部の溶体化処理工程では、ワークを高速かつ均一に昇温するための高速昇温炉と保持炉とを組み合わせる溶体化処理を行っている。図 4 にその内の高速昇温炉の一例を示す。この高速昇温炉 1 は、側面にワーク搬入口 2 2 を有する耐火壁 2 1 によって囲まれ、下部にバーナなどの加熱手段 B が設けられた炉室 2 と、炉室 2 内に同心的に配置された円筒状のワーク収納室 3 と、ワーク収納室 3 の上部開口 3 3 側に設けられた循環ファン (ラジアルファン) 4 とから構成されている。

【0007】ワーク収納室 3 内部にはワーク W を載置する載置棚 3 1 が設けられており、この載置棚 3 1 と平行して炉室 2 のワーク搬送口 2 2 に連通したワーク搬送路 3 2 が一体的に設けられている。ワーク搬送口 2 2 の外壁面にはワーク搬送口 2 2 を閉塞するための扉 D が開閉可能に設けられている。

【0008】循環ファン 4 を作動させることにより、加熱手段 B により直接的に加熱されたワーク収納室 3 内の熱風は、上部開口 3 3 より吸い上げられ炉室 2 とワーク収納室 3 との間の循環通路 5 を渦流となって下降した後、再び加熱手段 B のバーナ炎とともにワーク収納室 3 の下部開口 3 4 よりワーク収納室 3 へと導かれる。

【0009】これによれば、ワーク収納室 3 を含む炉室 2 内の雰囲気は急速に加熱され、ワーク収納室 3 内のワーク W も急速、かつ、均一に所望の熱処理温度まで昇温することが可能となった。

【0010】

【発明が解決しようとする課題】しかしながら、さらにワーク W の昇温効率を上げようとしたとき、上述した従来の構成では、循環ファン 4 から送り出された熱風の循環通路 5 内にワーク搬送路 3 2 があるため、このワーク搬送路 3 2 が抵抗となり、循環ファン 4 によって発生した渦流が均一に下降することができず、ワーク収納室 3 の下部開口 3 2 への流量や均一性などが不均一になるおそれがあった。

【0011】また、下方に向けて生成された渦流を再びワーク収納室 3 内に向けて上方へ導く際に、ワーク収納室 3 の下部開口 3 4 付近に熱風の一部が停滞して乱流を

生じ、この乱流もワーク収納室3への流入抵抗になるおそれもあった。

【0012】そこで、本発明は上述した課題を解決するためになされたものであって、その目的は、炉室内の熱風循環路を妨げるものをなくし、構造的にワークの昇温効率をより高めることができる高速昇温炉を提供することにある。

【0013】

【課題を解決するための手段】上述した目的を達成するため、本発明はワーク搬送口を有する耐火壁によって囲まれており、その内側に向けてバーナなどの加熱手段が設けられた炉室と、上記炉室内にその内壁面から所定の隙間をもって同心的に配置され、内部にワークを載置する載置棚が設けられた筒状のワーク収納室と、上記加熱手段により加熱された上記炉室内の雰囲気を上記ワーク収納室を経由して強制的に循環する循環ファンとを備えた高速昇温炉において、上記ワーク収納室は、上記炉室の

上記ワーク搬送口に対向して配置された第2のワーク搬送口を有し、上記第2のワーク搬送口には開閉可能な扉が設けられ、上記扉が開状態のとき、上記炉室の内壁と上記ワーク収納室の外壁との間の全周にわたって上記雰囲気が循環する循環通路が確保されることを特徴としている。

【0014】これによれば、ワークの加熱時には扉が閉じられて、炉室とワーク収納室との間に設けられた循環通路内に空気抵抗になるものがなくなるため、より理想状態に近い熱風循環が得られる。

【0015】本発明において、上記扉は上記炉室の上記ワーク搬送口方向に向けて観音開き式に開閉可能であることが設計上好ましいが、これ以外にワーク収納室に沿ってスライドするスライド式扉であってもよく、扉が開状態のときに、ワーク収納室に沿って閉塞されるものであれば特に限定されない。

【0016】ワーク収納室内に、炉室内を循環した熱風をより効率的に導き入れるためには、上記収納室の吸込側には、上記循環ファンによって渦流状に生成された上記雰囲気が上記循環通路を通して上記収納室に導かれる際に、上記渦流を維持させるための整流板が設けられていることが好ましい。

【0017】上記整流板は、上記循環ファンの回転方向と同方向に上記収納室の外周方向から軸方向に向けて収束するに円弧状に設けられていることが好ましく、これによれば、渦流がより加速されて、ワーク収納室内に導かれ、結果的にワークの昇温効率が上がる。

【0018】

【発明の実施の形態】次に、本発明の実施形態について説明する。図1にはこの実施形態に係る高速昇温炉を模式的に表した側部断面図が示されている。なお、先に説明した図4の従来装置と同一もしくは同一と見なされる構成要素には同じ参照符号が用いられている。

【0019】この高速昇温炉1aは、側面にワーク搬送口22（以下、第1ワーク搬送口とする）を有する耐火壁21によって囲まれ、その内側に向けてバーナなどの加熱手段Bが設けられた炉室2と、炉室2内に同心的に配置された筒状のワーク収納室3と、ワーク収納室3の上部開口33側に配置された循環ファン（ラジアルファン）4とを備えている。

【0020】炉室2の第1ワーク搬送口22の前面には、第1ワーク搬送口22を開閉する炉室扉Dが設けられている。この実施形態において、炉室扉Dは図示しない昇降手段に接続され、ワークWの搬送時に上下方向にスライド開閉する。なお、炉室扉Dの開閉機構については特に限定されない。

【0021】この実施形態において、加熱手段Bは都市ガスなどを利用した高カロリーバーナーからなり、ワーク収納室3の下部開口34に向けてバーナ炎を吹き出すように炉室2の下側に同軸的に配置されている。

【0022】ワーク収納室3は、両端が開口された耐熱金属製の円筒体（角筒体であってもよい。）からなり、炉室2の内周面23から所定の間隔をもって図示しないブラケットによって炉室2内のほぼ中央に同心的に配置されている。ワーク収納室3の内部には、ワークWが載置される載置棚31が設けられている。この実施形態において、載置棚31はワークWの搬送方向に平行な簀の子状に設けられている（図2参照）。

【0023】炉室2の第1ワーク搬送口22に対向したワーク収納室3の側面には、ワーク収納室3内にワークWを搬送するための第2ワーク搬送口35が設けられている。この実施形態において、第2ワーク搬送口35は、第1ワーク搬送口22とほぼ同じ開口幅、開口高さになるように開口されている。

【0024】図2（図1のA-A線断面図）に示すように、第2ワーク搬送口35には、その開口を開閉するためのワーク収納室扉7が設けられている。ワーク収納室扉7は収納室3の外周壁に沿った円弧状に形成された2枚の扉体71a、71bからなり、この実施形態において、各扉体71a、71bは第1ワーク搬送口22に向けて観音開き式に開閉可能に取り付けられている。

【0025】各扉体71a、71bと収納室3とはヒンジ部73、73によって連結されており、各扉体71a、71bは、開閉シャフト72を介して炉室2の外壁に設けられているモータなどの扉開閉手段に連結されている。この実施形態において、ヒンジ部73は熱風の抵抗を極力小さくした形状に形成されていることが好ましい。また、炉室2の内壁23はワーク収納室3の外周面に沿って円筒状に形成されていることが好ましい。

【0026】これによれば、各扉体71a、71bが開状態のとき、炉室2とワーク収納室3との間には、その全周にわたって循環ファン4によって生成された熱風が炉室2内を循環する際の循環通路5が確保される。すな

わち、循環通路5を遮るものがないため、収納室3の下部まで安定して熱風が通過することができる。

【0027】ワーク収納室3の下部開口34側には、ワーク収納室3内を循環する渦流を更に加速させるための整流板6が設けられている。整流板6は、図3に示すように収納室3の外周方向から軸方向に向けて円弧状に収束する多数のブレード61から構成されている。

【0028】この実施形態において、ブレード61は循環ファン4の回転方向と同方向に収束されており、これによれば、循環ファン4の回転方向と同じ回転方向の渦流が収納室3内部に発生し易くなり、熱風が収納室3内を抵抗なく循環することができる。また、整流板6の下側には、補強用のリブ62がバーナB方向に向けて突設されている。

【0029】再び、図1を参照すると、循環ファン4は下方側が開放された断面コ字状のファン本体41と、ファン本体41に回転力を伝達する回転シャフト42とから構成されている。この実施形態において、ファン本体41は周縁に図示しない羽根が多数設けられたラジアルファンからなり、図示しない駆動手段に接続された回転シャフト42を回転することにより、ワーク収納室3内の熱風を吸い上げ、炉室2とワーク収納室3との間の循環通路5内に吹き出すようになっている。

【0030】以上のように構成された高速昇温炉1の一連の動作について説明する。循環ファン4により炉室2内に所定温度の熱風を循環させた状態で、炉室扉Dとワーク収納室扉7とを開けて、図示しない搬送手段によって保持されたワークWを第1搬送口22から第2搬送口35を介してワーク収納室3内の載置棚31に載置した後、ワーク収納室扉7と炉室扉Dとを閉める。その開閉順序は、炉室扉D側を先にしてもよいし、ワーク収納室扉7側を先にしてもよい。

【0031】いずれにしても、ワーク収納扉7が閉じられることにより、炉室2とワーク収納室3の間には全周にわたってほぼ均一の循環通路5が確保されるため、熱風が渦流となって炉内を循環し、ワークWを高速かつ安定した状態で所望の処理温度まで昇温することができる。ワークWの昇温後、ワークWは再びワーク搬送口22、25を介して炉内から取り出され、図示しない保持炉へと移送される。

【0032】上記実施形態において、ワーク収納室扉7は、観音開き式扉によって構成されているが、これ以外にワーク収納室3に沿って開閉可能なスライド式扉であってもよく、閉塞時に循環通路5を妨げない構成であれば、適宜選択可能である。

【0033】また、上記実施形態では載置棚31に1つのワークWが載置されるようになっているが、より大径に形成して複数のワークWを載置するようにしてもよい。この場合、ワークWの取り出しに際し、載置棚31をターンテーブルに構成してもよく、このような態様も本発明に含まれる。

【0034】

【発明の効果】以上説明したように、本発明によれば、ワークを熱風循環することにより急速昇温する高速昇温炉において、炉室とワーク収納室との間の循環通路内に抵抗となるものがないため、ワークの昇温効率をより高めることができる。

【0035】また、ワーク収納室の下端に整流板を設けて、ワーク収納室内により強い渦流を発生させることにより、さらに昇温効率を高めることができる。

【図面の簡単な説明】

【図1】本発明の一実施例に係る高速昇温炉の側部断面図。

【図2】図1のA-A線断面図。

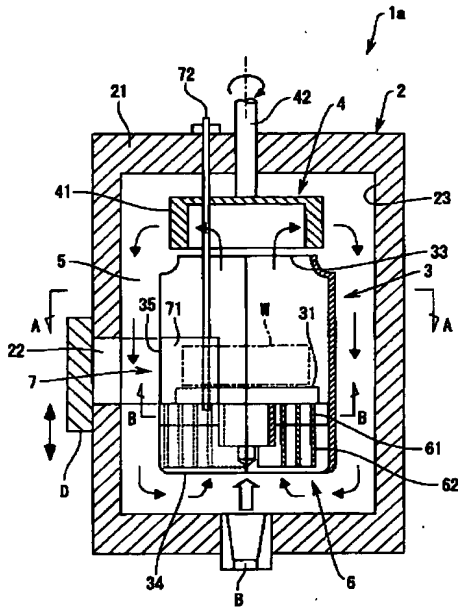
【図3】図1のB-B線断面図。

【図4】従来の高速昇温炉の側部断面図。

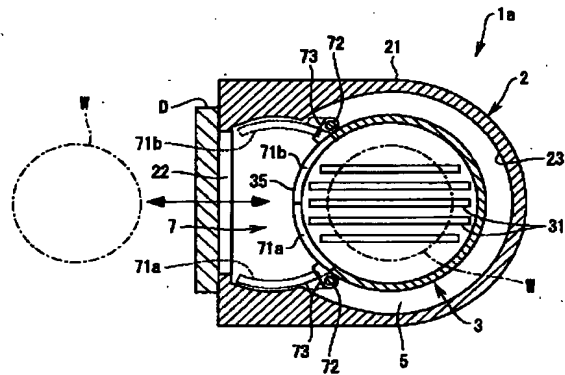
【符号の説明】

- 1 a 高速昇温炉
- 2 炉室
- 2 1 耐火壁
- 2 2 第1ワーク搬送口
- 3 ワーク収納室
- 3 1 載置棚
- 3 2 ワーク搬送路
- 3 3 上部開口
- 3 4 下部開口
- 3 5 第2ワーク搬送口
- 4 循環ファン
- 4 1 循環ファン本体
- 4 2 回転シャフト
- 5 循環通路
- 6 整流板
- 6 1 ブレード
- 7 ワーク収納室扉
- 7 1 a、7 1 b 扉体
- 7 2 開閉シャフト
- 7 3 ヒンジ部
- D 炉室扉
- B 加熱手段

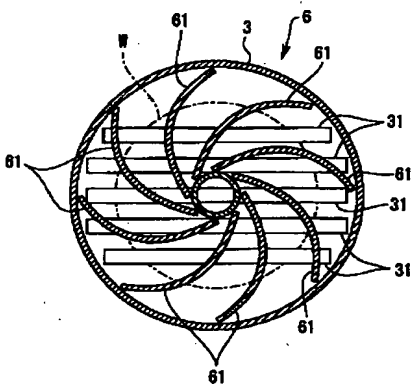
【図1】



【図2】



【図3】



【図4】

